

Appl. No. 10/081,815

Reply to Office Action of February 24, 2005

REMARKS

Claims 1-20 are pending in the application. The status of the application is as follows:

Claims / Section	35 U.S.C. Sec.	References / Notes
Specification - Abstract	Objection	<ul style="list-style-type: none">• Typographical error
Specification	Objection	<ul style="list-style-type: none">• Lack of clarity
2-10, 14	Objection	<ul style="list-style-type: none">• Informalities
Drawings	Objection	<ul style="list-style-type: none">• Non-described reference characters
1-20	§112, Second Paragraph Indefiniteness	<ul style="list-style-type: none">• Narrative and indefinite language
9	§112, Second Paragraph Indefiniteness	<ul style="list-style-type: none">• Indefinite language
1-5, 7 & 10-14	§102(b) Anticipation	<ul style="list-style-type: none">• Moshfeghi (U.S. Patent No. 5,633,951).
6	§103(a) Obviousness	<ul style="list-style-type: none">• Moshfeghi (U.S. Patent No. 5,633,951); and• Benkelman (U.S. Patent No. 6,694,064).
8 & 15-20	§103(a) Obviousness	<ul style="list-style-type: none">• Moshfeghi (U.S. Patent No. 5,633,951); and• Schneider (U.S. Patent No. 6,351,573).

5 Applicants have canceled independent claims 1 and 12, and has added independent claims 21 and 22. Applicants have further amended the dependent claims in the application, and have also provided discussion for distinguishing the present invention, with claims as amended, from the art cited against it.

Applicants' use of reference characters below is for illustrative purposes
10 only and is not intended to be limiting in nature unless explicitly indicated.

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

OBJECTION TO THE SPECIFICATION - ABSTRACT

1. *Applicants have amended the abstract in accordance with the Examiner's suggestion.*

Applicants thank the Examiner for pointing out this correction.

5

OBJECTION TO THE SPECIFICATION

2. *Applicants have amended the Specification to clarify the linguistic relationship.*

Applicants have amended the bottom carryover paragraph on p. 2 to indicate the relationship between the terms used and to maintain consistency in terminology. Namely, the measuring methods of x-ray diagnosis and magnetic resonance tomography are exemplified as being combined. The amended language is presented as being clearer, but Applicants welcome any suggestions by the Examiner.

10

OBJECTIONS TO THE CLAIMS - INFORMALITIES

15 3. *Applicants have added the language "further comprising" in accordance with the Examiner's suggestion for claims 2-10 and 14, the independent claims now refer to an examination subject, and antecedent basis issues with claims 8 and 9 have been corrected.*

Applicants thank the Examiner for pointing out these corrections.

20

4. *Applicants have amended claim 9 so that the landmark correspondence is to two arbitrary landmarks, in conformance with the Specification.*

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

In the OA on p. 3, under numbered paragraph 8, the Examiner indicated that the specification does not describe the elements defined by the last four lines of claim 9, whereby three landmarks in an arbitrary sequence in each data set correspond to two "said" landmarks and a differently spaced landmark.

5 Applicants have amended claim 9 to refer to "arbitrary" landmarks, instead of "said" landmarks. This language corresponds to the supporting language on p. 10 of the specification within the paragraph designated with a "b").

OBJECTIONS TO THE DRAWINGS

5. *Applicants have amended the specification to include the shorthand*
10 *nomenclature utilized by the drawings.*

The Applicants have amended the specification to include the shorthand nomenclature utilized by the drawings, and therefore changes to the drawings are not required.

35 U.S.C. §112, SECOND PARAGRAPH, CLAIMS 1-20 INDEFINITENESS

15 6. *Applicants have cancelled the original independent claims 1-12 and have added new independent claims 21 and 22 and made amendments to the dependent claims that address the indefiniteness issues raised by the Examiner.*

Applicants amendments, cancellations, and additions to the claims address the indefiniteness issues raised by the Examiner.

20 The Examiner requested, on p. 4, paragraph 11(c) of the OA, clarification as to what is meant by the terms "dataset" and "measured result". The Applicants have acted as their own lexicographers and defined these terms in the Specification at, e.g., the carryover paragraph at the bottom of p. 13. The

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

visualized measured result of a test subject is defined by way of example as a magnetic resonance image—it is any type of measured result that can be represented in a visualized manner.

The term "dataset" has been taken out of the independent claims, but
5 remains in certain dependent claims. This too is defined in the above-described paragraph as data containing spatial information related to a test subject— by way of example, this is described as data from two navigation systems of minimally invasive medical devices. Thus, the dataset containing spatial information is not necessarily one limited to data that can be represented in a visualized manner.
10 The last sentence states, "...it is possible to mix positions of sensors that are defined in the coordinate system of a navigation system into a visualized measured result of a nuclear magnetic resonance tomography apparatus," illustrating a combination of these.

With the new independent claims, it is now clear that the subject-matter of
15 the present invention is directed to the matching of two or more measured results in the medical field in a very simple but still efficient manner. It provides an apparatus and appertaining method for using landmarks which are either automatically or manually inserted by a user into the visualized (or optically presented) measured results.

20 Afterwards, it is determined if a sufficient number of landmarks has been arranged in the visualized measured results. For example, a two-dimensional measured result requires at least two landmarks and a three-dimensional measured result requires at least three landmarks (see the Specification, p. 14,

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

fourth paragraph). Afterwards, if it has been determined that a sufficient number of landmarks has been arranged in the visualized measured result, the spatial allocation of the arranged landmarks in the visualized measured result is analyzed using a first algorithm.

5 The previously described steps are performed for each measured result separately. Therefore, at least two (a first and a second) visualized measured result are processed. A detailed description of this process can be found between page 14, first paragraph, and page 15, last paragraph.

Afterwards, respectively matching landmarks from the (at least first and
10 second) visualized measured results are allocated to form landmark pairs using a second algorithm on the basis of the analyzing results from the first algorithm.

With regard to the Examiner's rejection described on p. 4 of the OA, paragraph 11(d), the Applicants have amended the Specification to add the clarifying reference characters to both steps S1 and S5 of Figure 1—it should
15 now be clear that "measured result 2" is simply shorthand nomenclature for the "second visualized medical measured result".

With regard to the remaining comments under paragraph 11 of the Examiner, the Applicants welcome any additional suggestions for remaining language that is found to be unclear after the present amendments.

20 With regard to the Examiner's comment under paragraph 12, claim 9 has been amended to clarify that the three landmarks are defined by a combination of two landmarks and a third landmark that is positioned to avoid an overall symmetrical arrangement of the three landmarks (that would introduce a potential

Appl. No. 10/081,815

Reply to Office Action of February 24, 2005

ambiguity into the analysis). The three landmarks in the last portion of claim 9 correspond with two arbitrary plus one differently spaced landmarks, and therefore represents a three-to-three correspondence. The term "defining" is synonymous with "establishing" or "creating"—and such an operation is illustrated
5 in e.g., Figs 2 and 3 by the points identified with reference characters.

35 U.S.C. §102(b), CLAIMS 1-5, 7 AND 10-14 ANTICIPATION BY MOSHFEGHI

7. *Moshfeghi fails to teach or suggest newly added independent claims 21 and 22 as it contains no description related to the use of landmarks to determine if a sufficient number of landmarks has been arranged and to analyze
10 the spatial allocation of the landmarks for each of the visualized images to be matched, use of the same algorithm for spatial analysis in the multiple images, and the formation of landmark pairs as claimed.*

In the OA, the Examiner, on p. 6, indicates that Moshfeghi anticipates each and every element of independent claims 1 and 12. Claims 1 and 12 have
15 been canceled and independent claims 21 and 22 have been added.

The Examiner has identified Moshfeghi's points P as corresponding to the landmarks of the present invention. However, Moshfeghi fails to teach or suggest the subject matter of the present invention. Moshfeghi does not disclose the very simple but still effective method and appertaining apparatus configured to match
20 two or more visualized measured results as defined by the present invention.

Specifically, Moshfeghi fails to teach or suggest the element of using landmarks to determine if a sufficient number of landmarks has been arranged

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

and to analyze the spatial allocation of the landmarks for each of the visualized images to be matched, as required by independent claims 21 and 22.

Moshfeghi further does not teach or suggest using the same (first) algorithm to analyze the spatial arrangement of the arranged landmarks in the various visualized images as required by independent claims 21 and 22.

Furthermore, Moshfeghi does not teach or suggest allocating respectively matching landmarks from the first and second visualized measured results to form landmark pairs using a second algorithm on the basis of the analyzing results from the first algorithm as required by independent claims 21 and 22.

10 Moshfeghi describes a technique for matching, registering, combining or correlating two or more images of a body or a region thereof. Specifically, Moshfeghi relates to the matching of two or more volumetric images where the imaged body region exhibits local geometric deformations which are accounted for by an elastic transformation (see column 1, lines 10 to 17). In this section, 15 Moshfeghi teaches extracting first and second corresponding surfaces from a respective first and second image, whereby the surfaces delineate the same features such as a bone/tissue interface.

This is performed by extracting a stack of contours for each surface. The first surface is iteratively warped toward alignment with the second surface to arrive at a global translation vector and a set of residual surface distortion 20 vectors. Further, volume distortion vectors are used to indicate the locations in the second volumetric image of voxel centers whose interpolated intensities are to be moved to lattice points. The various steps are repeated in successive

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

iterations until a measure of miss-registration between the volumetric image is less than a predetermined value, with the elastic stiffness constant being decreased each time (see the Abstract).

Since Moshfeghi fails to teach or suggest several elements according to
5 newly added independent claims 21 and 22, Applicant asserts that the independent claim language clearly distinguishes over the prior art, and respectfully request that the Examiner withdraw the §102(a) rejection from the present application.

10 35 U.S.C. §103(a), CLAIMS 6, 8 AND 15-20 OBVIOUSNESS OVER MOSHFEGHI IN VIEW OF A COMBINATION OF BENKELMAN AND SCHNEIDER

8. *Applicants rely on the arguments made with regard to Moshfeghi and assert that the addition of Benkelman and Schneider to the combination fails to teach or suggest the elements of the independent claims addressed above.*

The arguments made above with regard to Moshfeghi are also applicable
15 to the Benkelman and Schneider references, either alone or in any combination with Moshfeghi. Applicants assert that the addition of Benkelman and Schneider to the combination fails to teach or suggest the elements of the independent claims addressed above.

Schneider discloses a method and an apparatus for obtaining and
20 displaying in real time an image of an object obtained by one modality such that the image corresponds to a line of view established by another modality. The present invention, as described above, does not refer to line of views.

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

Benkelman is related to a computer-implemented method and a system for
use in alignment of multiple digital images to form a mosaic image. The present
invention, as described above, does not relate to the forming of mosaic images.
The Examiner has provided these references as obviating various other aspects
5 of the dependent claims.

For these reasons, the Applicant asserts that the amended claim language
clearly distinguishes over the prior art, and respectfully request that the Examiner
withdraw the §103(a) rejection from the present application.

CONCLUSION

10 Inasmuch as each of the objections have been overcome by the
amendments, and all of the Examiner's suggestions and requirements have been
satisfied, it is respectfully requested that the present application be reconsidered,
the rejections be withdrawn and that a timely Notice of Allowance be issued in
this case.

15

Respectfully submitted,



(Reg. No. 45,877)

Mark Bergner
SCHIFF HARDIN, LLP
PATENT DEPARTMENT
6600 Sears Tower
Chicago, Illinois 60606-6473
(312) 258-5779
Attorney for Applicants
Customer Number 26574

20

25

Appl. No. 10/081,815
Reply to Office Action of February 24, 2005

CERTIFICATE OF FACSIMILE

I hereby certify that this correspondence is being telefaxed to the U.S. Patent and Trademark Office telephone number (703) 872-9306 and addressed to: Mail Stop Amendment Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450 on May 24, 2005.

5


